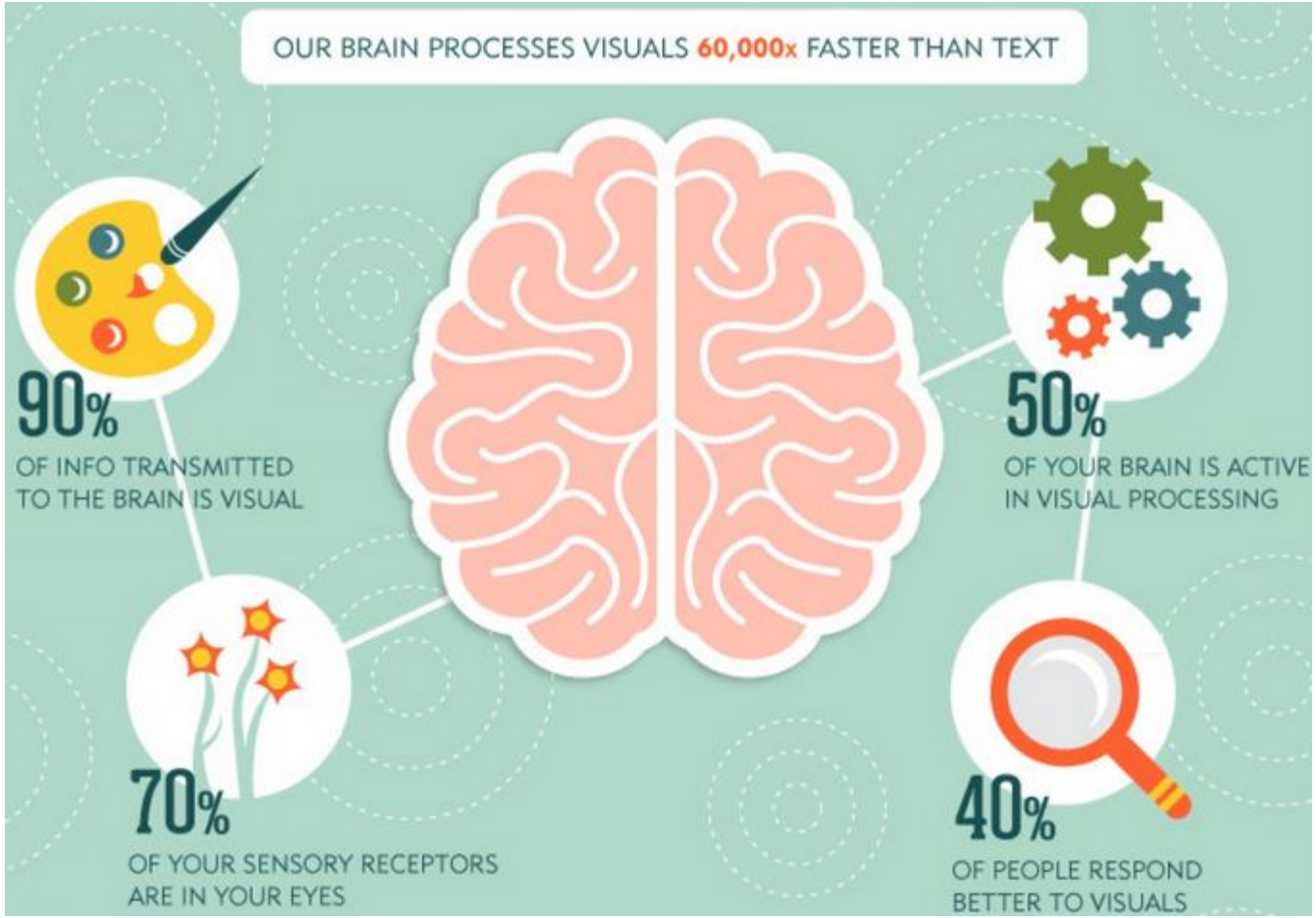
Visualización en Data Science

Diplomatura CDAAyA 2018


OUR BRAIN PROCESSES VISUALS 60,000x FASTER THAN TEXT
90%
OF INFO TRANSMITTED TO THE BRAIN IS VISUAL
50%
OF YOUR BRAIN IS ACTIVE IN VISUAL PROCESSING
70%
OF YOUR SENSORY RECEPTORS ARE IN YOUR EYES
40%
OF PEOPLE RESPOND BETTER TO VISUALS

- Our brain process visuals 60000 faster than text
- 90% of the information transmitted to the brain is visual
- 70% of your sensory receptors are in your eyes
- 50% of your brain is active in visual processing
- 40% of people respond better to visuales

Herramienta para la comunicación

Herramienta para la compresión

	A	B	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL
1					Optimizer			Config						Dataset						Metrics COURSE 1				Metrics COURSE 6				Metrics COURSE 16				Metrics COURSE 21				
2	Results	Log	Trucar	Diff	Optim	LR	Cell	batch_	dropc	epoch	embedc	hidder	max_s	Filter	Merge	Pretra	Finetı	AUC R(	rmse	AUC R(	rmse	Accura(	R2	AUC R(	rmse	Accura(	R2	AUC R(	rmse	Accura(	R2	AUC R(	rmse	Accura(	R2	Eval all
3																																				
4	LSTM																																			
5	../results/kddcup/lstm/pre	14648	N					100	0.3	500	-	100	50	> 5	Y	-	-			0.787	0.388	0.795	0.278													
6	/home/mteruel/edm/resul	14662	N					100	0.3	500	-	100	50	> 5	Y	-	-			0.879	0.359	0.831	0.439	0.794	0.345	0.850	0.275	0.605	0.533	0.672	-0.308	0.498	0.456	0.770	-0.431	
7	/home/mteruel/edm/resul	14663	N					100	0.3	500	-	50	50	> 5	Y	-	-			0.880	0.359	0.827	0.438	0.802	0.339	0.858	0.296	0.656	0.511	0.685	-0.183	0.597	0.414	0.800	-0.199	
8	/home/mteruel/edm/resul	14664	N					100	0.3	500	-	50	100	> 5	Y	-	-	0.814	0.374	0.881	0.361	0.822	0.431	0.804	0.336	0.864	0.315	0.666	0.490	0.713	-0.108	0.626	0.405	0.795	-0.094	
9	../results/kddcup/lstm/pre	14735	Y					50	0.3	500	-	50	50	> 5	Y	-	-			0.759	0.467	0.617	0.050	0.657	0.415	0.784	-0.053	0.611	0.500	0.613	-0.164	0.634	0.398	0.783	-0.074	
10	../results/kddcup/lstm/pre	14885	N					50	0.3	500	-	50	50	N	Y	-	-	0.837	0.335	0.871	0.341	0.855	0.450	0.842	0.290	0.895	0.369	0.741	0.386	0.796	0.153	0.662	0.418	0.771	-0.195	14939
11			N					100	0.3	500	-	50	100	N	Y	-	-			0.871	0.339	0.851	0.458	0.837	0.289	0.896	0.375	0.748	0.390	0.800	0.138	0.633	0.416	0.797	-0.181	14937
12																																				
13	Embeddings																																			
19	/home/mteruel/edm/resul	14661	N					100	0.3	500	50	50	100	> 5	N	N				0.885	0.352	0.836	0.457	0.814	0.335	0.856	0.326	0.703	0.466	0.723	0.006	0.724	0.393	0.797	-0.047	
20	/home/mteruel/edm/resul	14667	N					100	0.3	500	50	50	50	> 5	N	N				0.880	0.359	0.829	0.439	0.813	0.332	0.867	0.330	0.687	0.478	0.705	-0.053	0.668	0.405	0.810	-0.142	
21	../results/kddcup/embedc	14706	Y					50	0.2	500	50	50	20	> 5	N	Y	Y			0.728	0.481	0.614	-0.010	0.683	0.390	0.798	0.069	0.641	0.467	0.687	0.004	0.599	0.404	0.773	-0.113	
22	../results/kddcup/embedc	14716	Y					100	0.3	500	50	50	50	> 5	Y	N				0.756	0.459	0.645	0.079	0.674	0.430	0.746	-0.153	0.649	0.462	0.673	0.036	0.534	0.422	0.770	-0.207	
23	../results/kddcup/embedc	14821	N					100	0.3	500	50	50	100	> 5	N	N		0.830	0.363	0.884	0.357	0.830	0.443	0.810	0.334	0.868	0.319	0.740	0.455	0.727	0.050	0.685	0.379	0.815	0.029	
24	../results/kddcup/embedc	14823	N					100	0.3	500	50	50	100	> 5	Y	N		0.834	0.361	0.884	0.358	0.825	0.442	0.813	0.333	0.865	0.322	0.731	0.456	0.715	0.043	0.688	0.375	0.831	0.051	
25	../results/kddcup/embedc	14828	N					50	0.2	500	50	100	20	> 5	Y	Y	Y	0.808	0.378	0.871	0.365	0.816	0.417	0.801	0.344	0.846	0.279	0.701	0.479	0.711	-0.053	0.575	0.407	0.813	-0.122	
26	../results/kddcup/embedc	14832	N					50	0.3	500	50	100	200	> 5	Y	Y	Y	0.818	0.370	0.879	0.359	0.825	0.436	0.788	0.340	0.861	0.296	0.707	0.471	0.711	-0.018	0.672	0.388	0.811	-0.021	
27	../results/kddcup/embedc	14858	N					50	0.3	500	50	100	200	> 5	Y	Y	N	0.825	0.365	0.875	0.365	0.827	0.420	0.806	0.338	0.854	0.302	0.714	0.449	0.739	0.076	0.650	0.383	0.824	0.007	
28	../results/kddcup/embedc	14873	N					50	0.3	500	20	100	200	> 5	Y	Y	Y	0.831	0.363	0.879	0.361	0.827	0.433	0.815	0.335	0.857	0.316	0.733	0.438	0.742	0.122	0.675	0.381	0.826	0.020	
29	../results/kddcup/embedc	14875	N					50	0.3	500	20	100	200	> 5	Y	Y	N	0.835	0.362	0.880	0.361	0.822	0.432	0.815	0.340	0.846	0.293	0.722	0.445	0.736	0.089	0.712	0.371	0.823	0.069	
30	../results/kddcup/embedc	14877	N					50	0.3	500	20	50	200	> 5	Y	Y	N	0.841	0.360	0.880	0.364	0.818	0.423	0.819	0.334	0.859	0.320	0.753	0.432	0.735	0.145	0.715	0.372	0.826	0.065	14941
31	../results/kddcup/embedc	14886	N					100	0.3	500	50	50	100	N	Y	N		0.850	0.330	0.887	0.338	0.853	0.461	0.850	0.291	0.895	0.366	0.783	0.379	0.807	0.184	0.699	0.396	0.813	-0.069	14922 +14
32	../results/kddcup/embedc	14887	N					50	0.3	500	20	100	200	N	Y	Y	Y	0.846	0.328	0.879	0.339	0.852	0.458	0.843	0.289	0.896	0.373	0.788	0.371	0.820	0.219	0.652	0.399	0.804	-0.089	x
33			N					50	0.3	500	20	50	200	N	Y	Y	N			0.881	0.339	0.851	0.456	0.843	0.290	0.892	0.366	0.804	0.362	0.831	0.258	0.740	0.379	0.814	0.020	14940
41	../results/kddcup/embedc	15167	N		adam	0.01	gru	100	0.3	500	20	50	200	N	Y	Y	Y	0.818	0.343	0.890	0.334	0.854	0.472	0.839	0.294	0.896	0.349	0.732	0.391	0.807	0.130	0.576	0.437	0.787	-0.305	
42	../results/kddcup/embedc	15177	N		adam	??	gru	100	0.3	500	20	50	200	N	Y	Y	Y	0.811	0.345	0.886	0.336	0.858	0.466	0.823	0.304	0.890	0.307	0.683	0.438	0.773	-0.088	0.627	0.419	0.801	-0.199	
43	../results/kddcup/embedc	15235	N		adam	0.01	lstm	100	0.3	500	50	50	100	N	Y	N		0.811	0.347	0.882	0.345	0.841	0.439	0.814	0.304	0.892	0.305	0.684	0.425	0.799	-0.026	0.621	0.411	0.810	-0.153	
44	../results/kddcup/embedc	15236	N		adam	0.01	lstm	50	0.3	500	20	100	200	N	Y	Y	Y	0.812	0.345	0.884	0.340	0.850	0.452	0.826	0.300	0.892	0.325	0.700	0.405	0.800	0.071	0.589	0.431	0.786	-0.265	
45	../results/kddcup/embedc	26285	N					100	0.3	500	20	20	300	N	Y	N		0.853	0.325	0.881	0.335	0.854	0.469	0.841	0.291	0.895	0.362	0.790	0.369	0.814	0.228	0.675	0.397	0.796	-0.076	
46	../results/kddcup/embedc	26286	N					100	0.3	500	20	20	300	N	Y	Y	Y	0.857	0.322	0.883	0.334	0.857	0.474	0.845	0.288	0.895	0.375	0.783	0.364	0.826	0.250	0.757	0.371	0.820	0.062	

	A	B	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL
1					Optimizer			Config						Dataset						Metrics COURSE 1				Metrics COURSE 6				Metrics COURSE 16				Metrics COURSE 21				
2	Results	Log	Trucar	Diff	Optim	LR	Cell	batch_	dropc	epoch	embedc	hidder	max_s	Filter	Merge	Pretra	Finet	AUC R(	rmse	AUC R(	rmse	Accura(	R2	AUC R(	rmse	Accura(	R2	AUC R(	rmse	Accura(	R2	AUC R(	rmse	Accura(	R2	Eval all	
3																																				
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5	../results/kddcup/lstm/pre	14648	N					100	0.3	500	-	100	50	> 5	Y	-	-			0.787	0.388	0.795	0.278														
6	/home/mteruel/edm/resul	14662	N					100	0.3	500	-	100	50	> 5	Y	-	-			0.879	0.359	0.831	0.439	0.794	0.345	0.850	0.275	0.605	0.533	0.672	-0.308	0.498	0.456	0.770	-0.431		
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11			N					100	0.3	500	-	50	100	N	Y	-	-			0.871	0.339	0.851	0.458	0.837	0.289	0.896	0.375	0.748	0.390	0.800	0.138	0.633	0.416	0.797	-0.181	14937	../
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21	../results/kddcup/embedc	14706	Y					50	0.2	500	50	50	20	> 5	N	Y	Y			0.728	0.481	0.614	-0.010	0.683	0.390	0.798	0.069	0.641	0.467	0.687	0.004	0.599	0.404	0.773	-0.113		
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23	../results/kddcup/embedc	14821	N																													0.685	0.379	0.815	0.029		
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28	../results/kddcup/embedc	14873	N																													0.675	0.381	0.826	0.020		
29	../results/kddcup/embedc	14875	N																													0.712	0.371	0.823	0.069		
30	../results/kddcup/embedc	14877	N																													0.715	0.372	0.826	0.065	14941	../
31	../results/kddcup/embedc	14886	N																													0.699	0.396	0.813	-0.069	14922 +14	../
32	../results/kddcup/embedc	14887	N																													0.652	0.399	0.804	-0.089	x	
33			N																													0.740	0.379	0.814	0.020	14940	../
41	../results/kddcup/embedc	15167	N																													0.576	0.437	0.787	-0.305		
42	../results/kddcup/embedc	15177	N																													0.627	0.419	0.801	-0.199		
43	../results/kddcup/embedc	15235	N																													0.621	0.411	0.810	-0.153		
44	../results/kddcup/embedc	15236	N																													0.589	0.431	0.786	-0.265		
45	../results/kddcup/embedc	26285	N																													0.675	0.397	0.796	-0.076		
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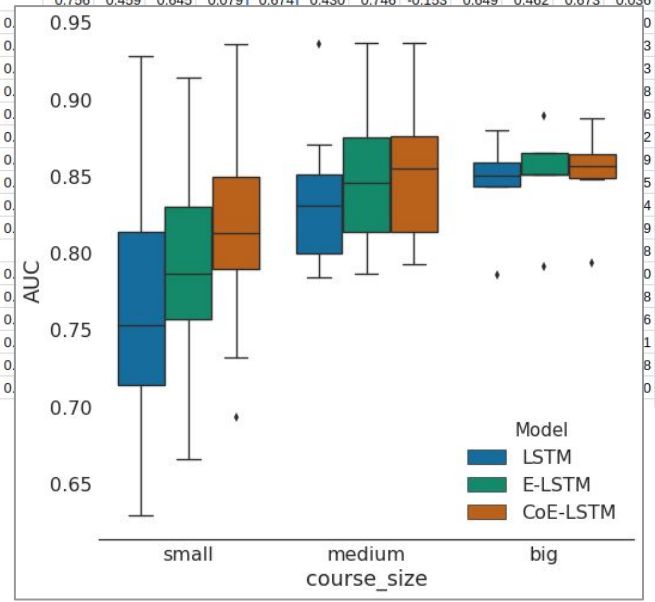

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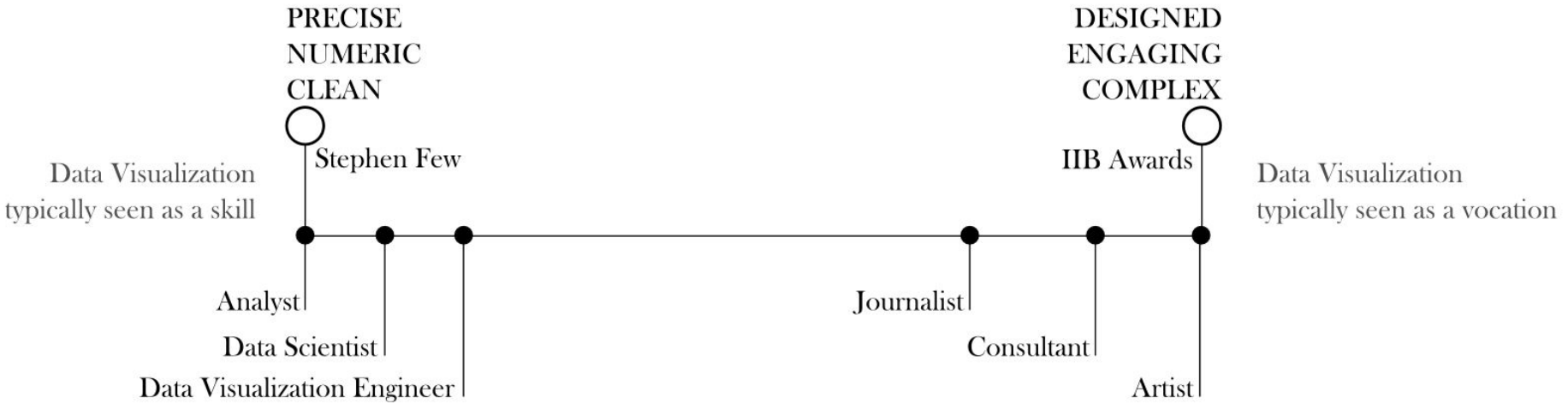
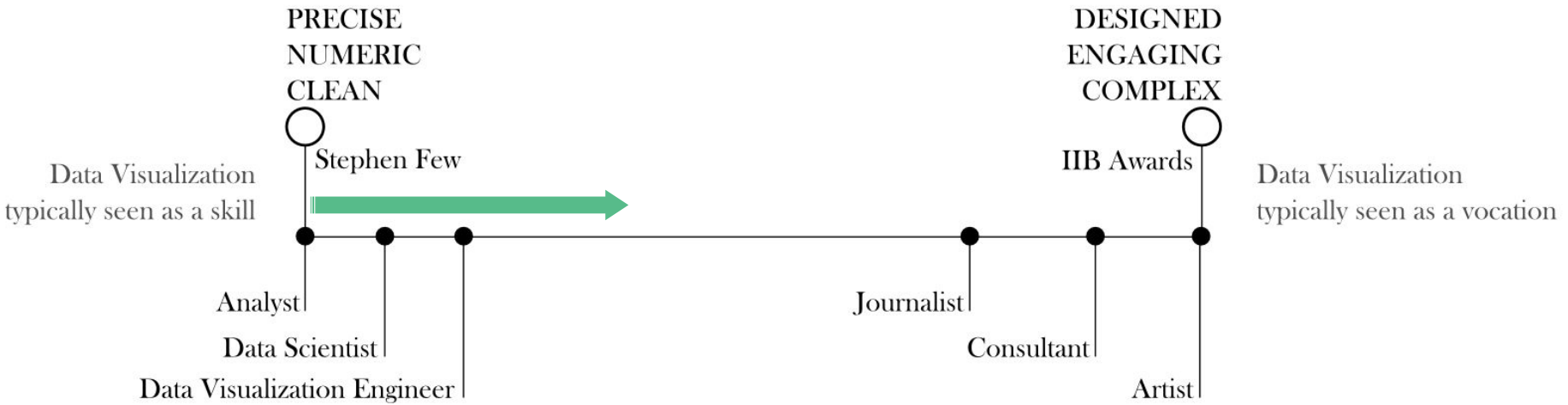


Credit: Medium Article

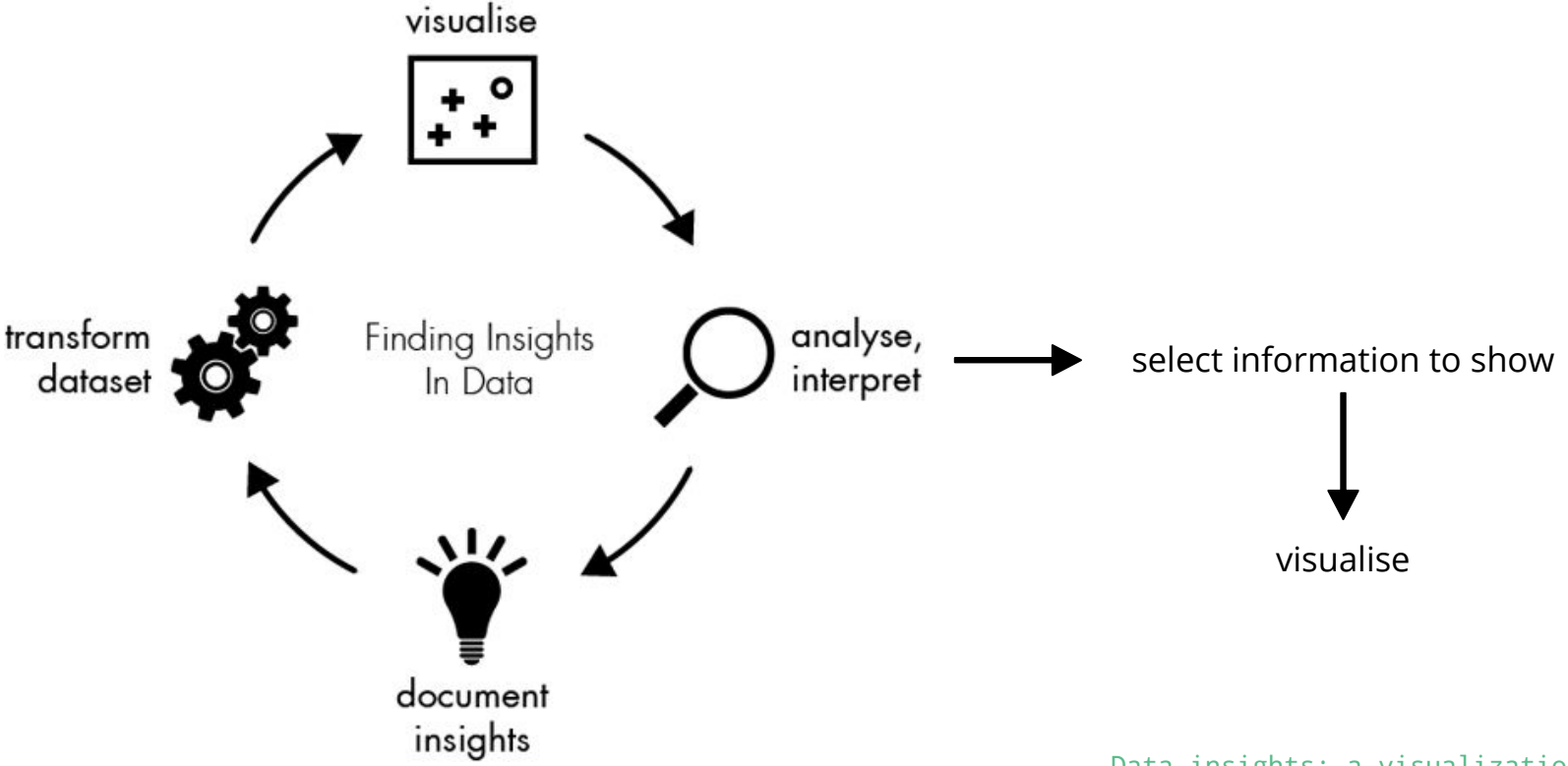
¿Podés identificar tu rol en esta línea? ¿A dónde querés llegar?



Credit: Medium Article

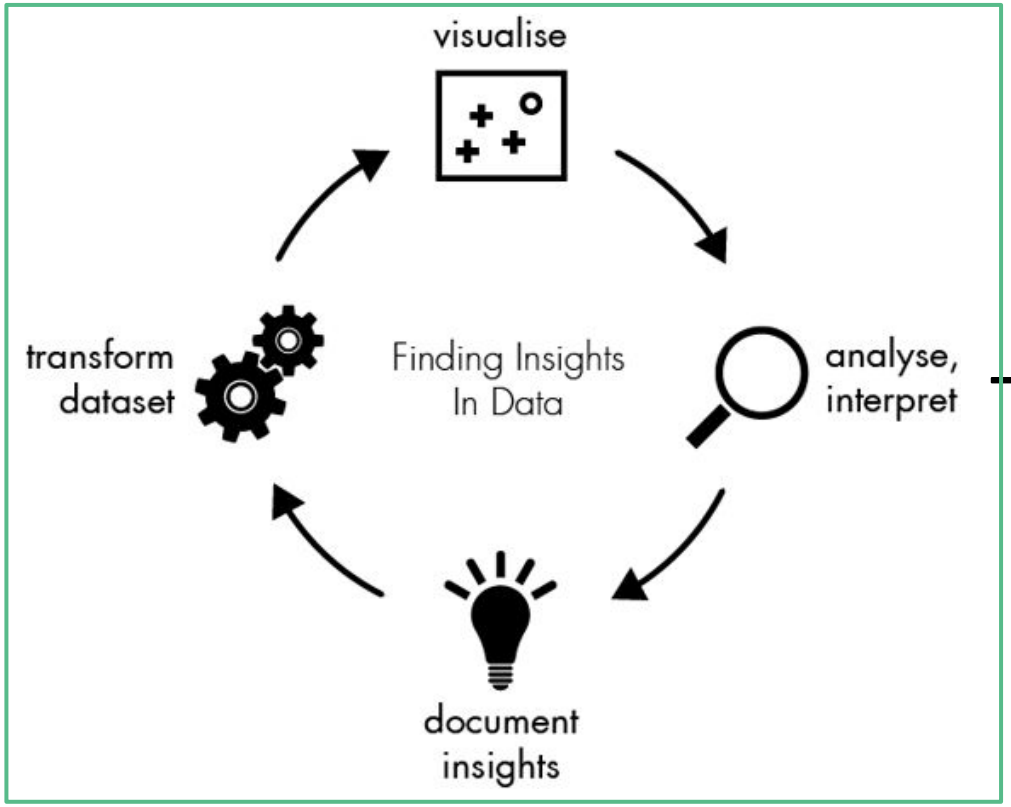
¿Podés identificar tu rol en esta línea? ¿A dónde querés llegar?

Exploración vs presentación



Data insights: a visualization (Gregor Aisch)

Exploración vs presentación

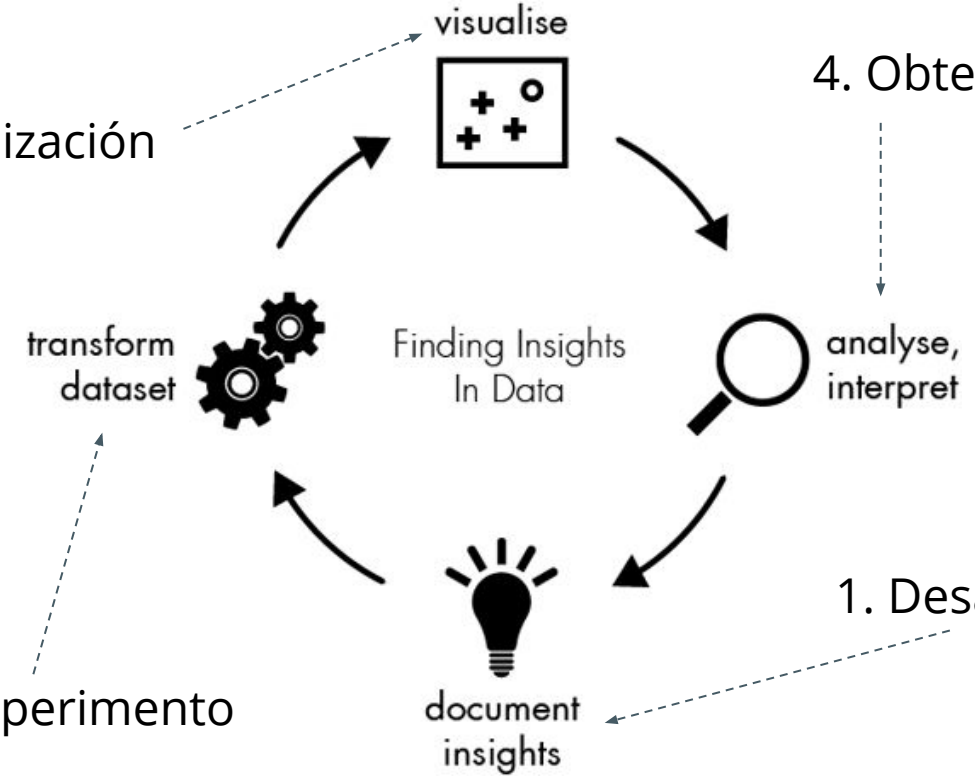


select information to show

visualise

Data insights: a visualization (Gregor Aisch)

Exploración



3. Diseñar visualización

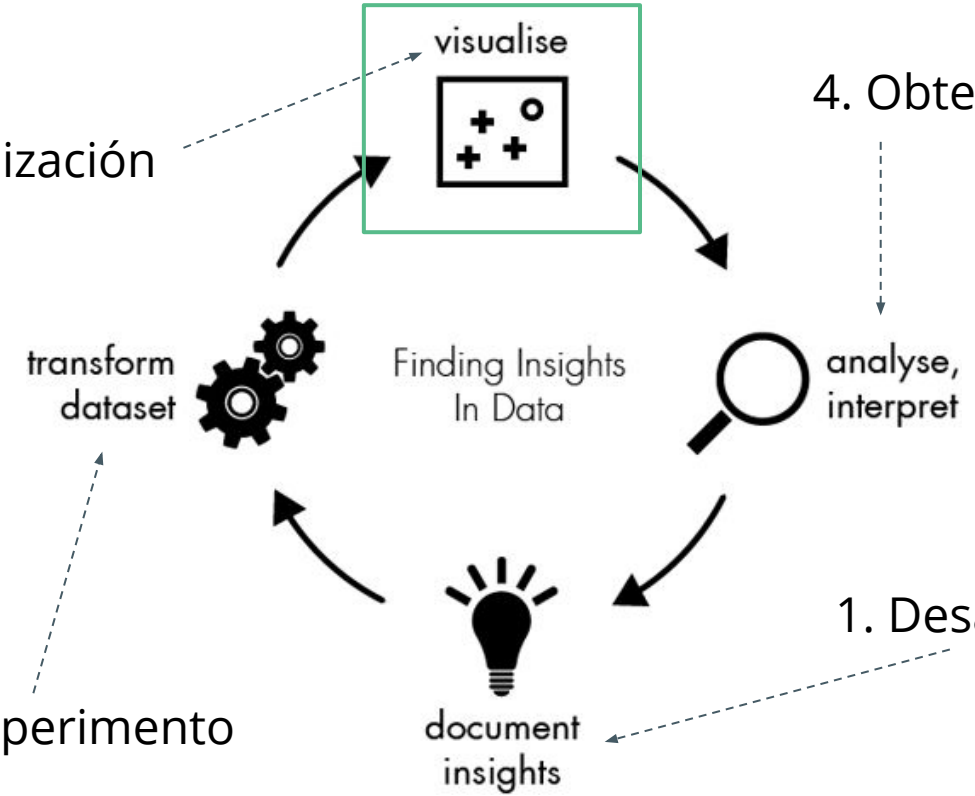
4. Obtener conclusiones

2. Diseñar experimento

1. Desarrollar una hipótesis

Data insights: a visualization (Gregor Aisch)

Exploración



3. Diseñar visualización

4. Obtener conclusiones

2. Diseñar experimento

1. Desarrollar una hipótesis

Data insights: a visualization (Gregor Aisch)

To calculate is not in itself to analyze

Edgar Allan Poe, Murders in the Rue Morgue

Configurar la notebook

Tipos básicos de gráficos

Tablas

- Muestran cantidades **exactas**
- Representan cualquier tipo de datos
- Son de acceso **universal**
- Son **fáciles** de crear
- Permiten comprar muchas variables

	Provincia	Población 2001	Población 2010	Variación absoluta	Variación relativa (%)
0	Ciudad de Buenos Aires	2.776.138	2.890.151	114.013	4,1
1	Buenos Aires	13.827.203	15.625.084	1.797.881	13,0
2	Catamarca	334.568	367.828	33.260	9,9
3	Chaco	984.446	1.055.259	70.813	7,2
4	Chubut	413.237	509.108	95.871	23,2
5	Córdoba	3.066.801	3.308.876	242.075	7,9
6	Corrientes	930.991	992.595	61.604	6,6
7	Entre Rios	1.158.147	1.235.994	77.847	6,7
8	Formosa	486.559	530.162	43.603	9,0
9	Jujuy	611.888	673.307	61.419	10,0

Tablas

Las tablas en general no son buenas **resaltando patrones**, pero con un poco de formato se vuelven más **legibles** (y cautivantes)

Ticker	Name	Value	Change
	Dow Jones	15,988.08	↓ -2.39%
	S&P 500	1,880.33	↓ -2.16%
	Technology		↑ 2.10%
IBM	IBM	130.00	↓ -2.19%
AAPL	Apple	97.05	↓ -2.48%
MSFT	Microsoft	50.99	↓ -3.99%

https://www.r-bloggers.com/formatting-table-output-in-r/

Tablas

Table 1. Grading rubric for writing assignments. Lists categories, evaluation criteria, and point values for each criterion.

Possible grade	Length	Topic	Argument	Mechanics	Citations
A	The paper meets the page length requirement and is formatted correctly. 10 points	Topic fits the scope of the project, makes a clear argument. 20 points	Project includes in-depth discussion and elaboration in all sections. 20 points	No spelling and/or grammar mistakes. 5 points	Cites all information from out of class discussion sources. APA citation style is used in both text and bibliography. 10 points
B	The paper meets the length requirement but has inconsistent citation formatting. 8.5 points	The paper is focused but does not make a clear argument. 17 points	Project includes in-depth discussion and elaboration in most sections. 17 points	Minimal spelling and/or grammar mistakes. 4.25 points	Cites most information obtained from other sources. 8.5 points
C	The paper is up to 1 page too short or too long or is incorrectly formatted. 7.5 points	Topic is either too broad or too narrow. 15 points	Project has omissions of content or content runs-on excessively. Paper relies heavily on quotations for content. 15 points	Several spelling and grammar mistakes. 3.75 points	Cites some information from other sources. Citation style is either inconsistent or incorrect. 7.5 points
D	The paper is more than 1 page longer or shorter than assigned. 6.5 points	Paper does not stay on topic. 13 points	Project has cursory discussion in all the sections of the paper or brief discussions in only a few sections. 13 points	Many spelling and grammar mistakes that make the paper hard to understand. 3.25 points	Does not cite sources. 6.5 points

https://accessibility.umn.edu/tutorials/data-vs-layout-tables

Gráficos de barra

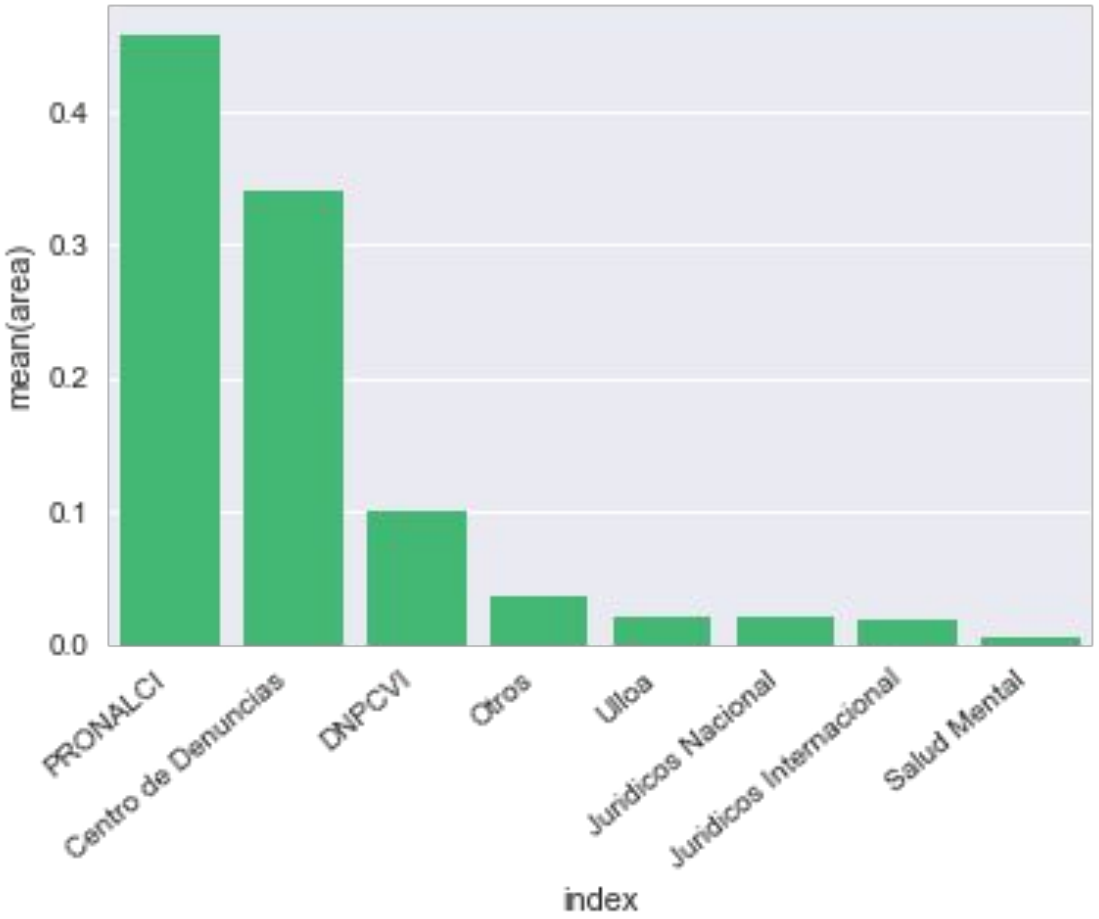
Comparan cantidades

numéricas entre variables

categóricas

Son uno de los encodings más

fieles y fáciles de percibir



Gráficos de barra

Permiten comparar cantidades

en **grupos**

Grouped vs stacked

Stacked at 100%

http://radacad.com/stacked-chart-or-clustered-which-one-is-the-best

Gráficos de barra

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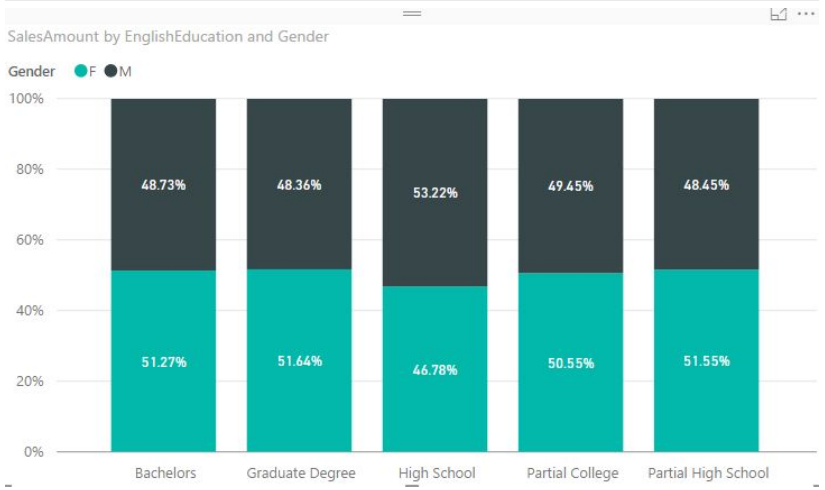
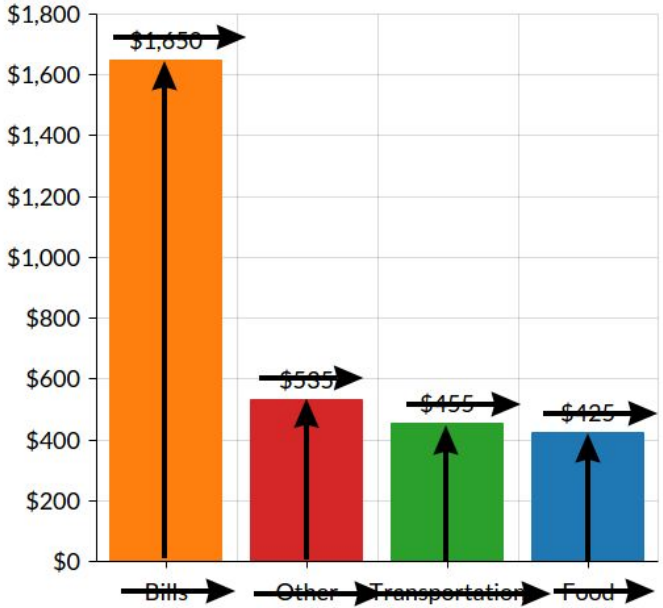


http://radacad.com/stacked-chart-or-clustered-which-one-is-the-best

Gráficos de barra



https://medium.com/the-mission/to-pie-charts-3b1f57bcb34a

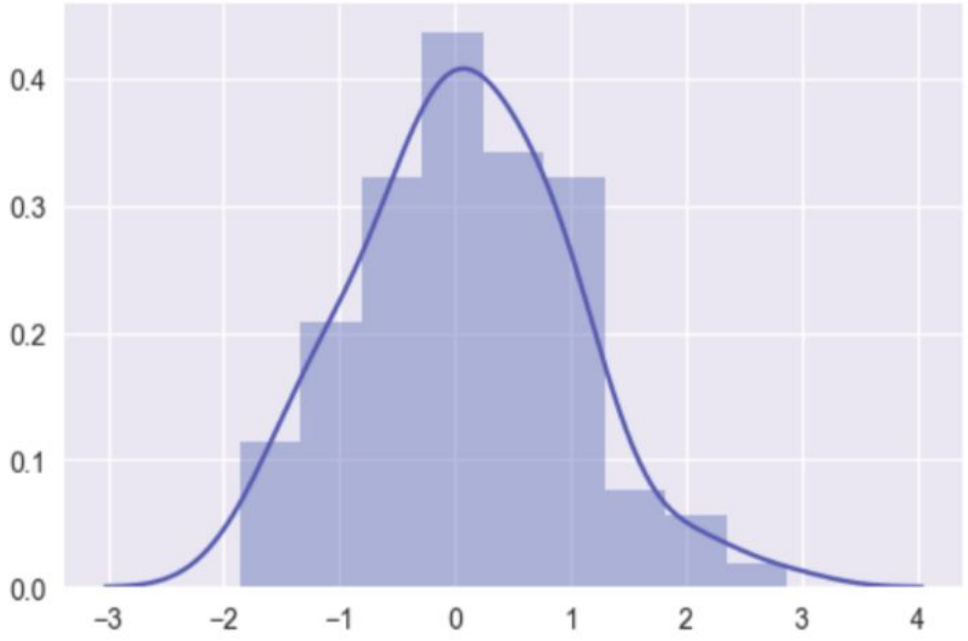
Histograma

- ¡No es lo mismo que un gráfico de barras!
- Muestra la **distribución** de **una** variable **numérica**
- Divide los datos en **bins**

Plotting univariate distributions

The most convenient way to take a quick look at a univariate distribution in seaborn is the `distplot(`

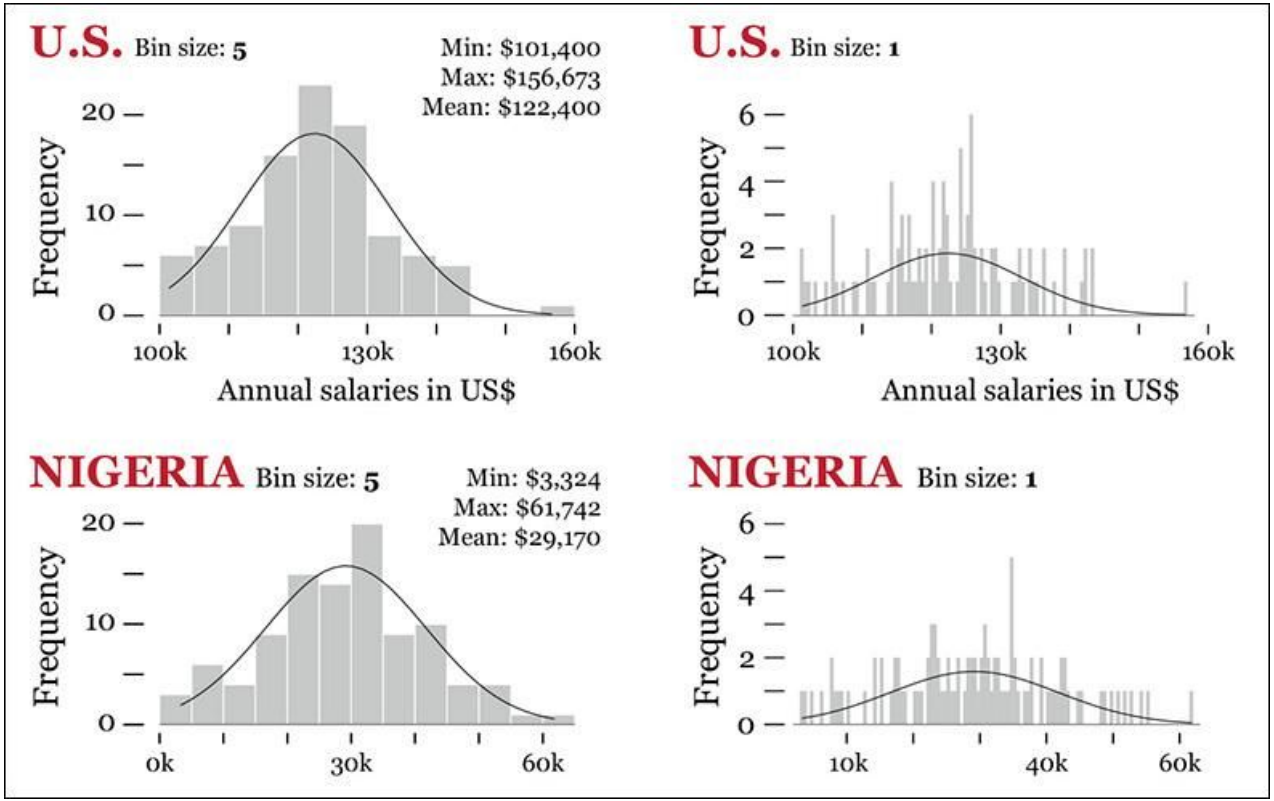
```
x = np.random.normal(size=100)
sns.distplot(x);
```



https://seaborn.pydata.org/tutorial/distributions.html

Histograma

La **binarización** es muy importante en el histograma resultante.

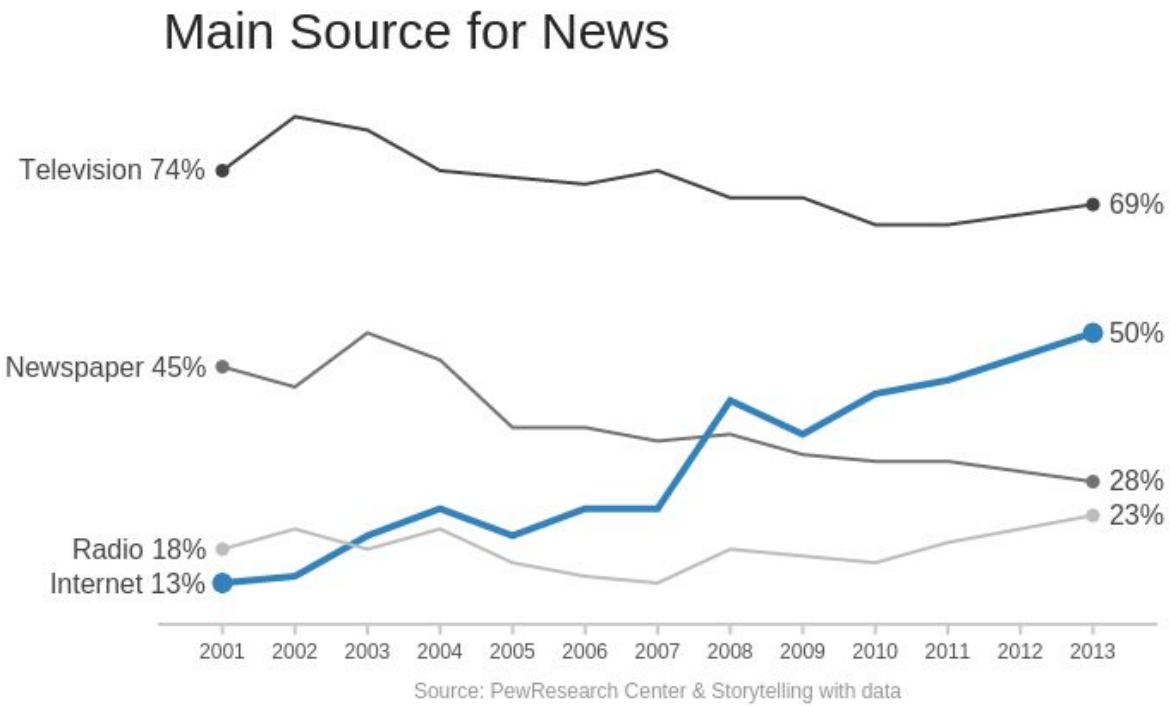


The Truthful Art: Data, Charts and Maps for Communication

Gráficos de línea

Cada línea representa la variación de dos **variables numéricas**

Múltiples líneas permiten comparar distintas categorías

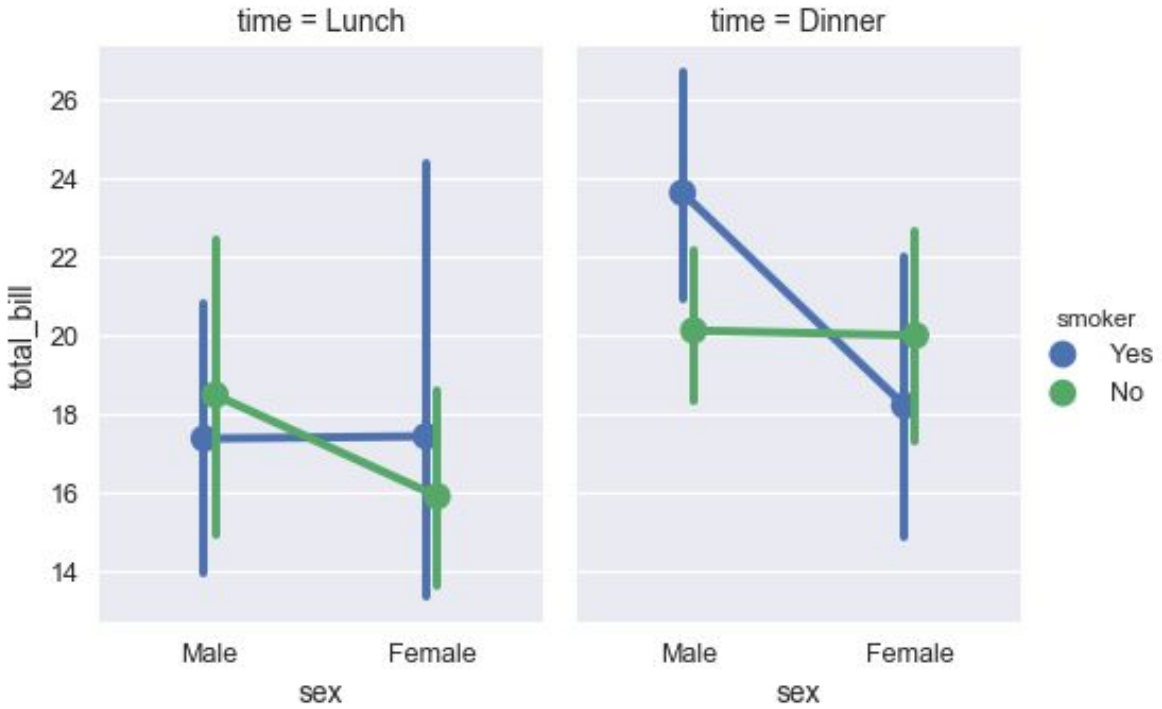


PyPlot tutorial

Gráficos de línea

Son muy versátiles

Generan gráficos visualmente simples, por lo que pueden contener mucha información



Seaborn tutorial

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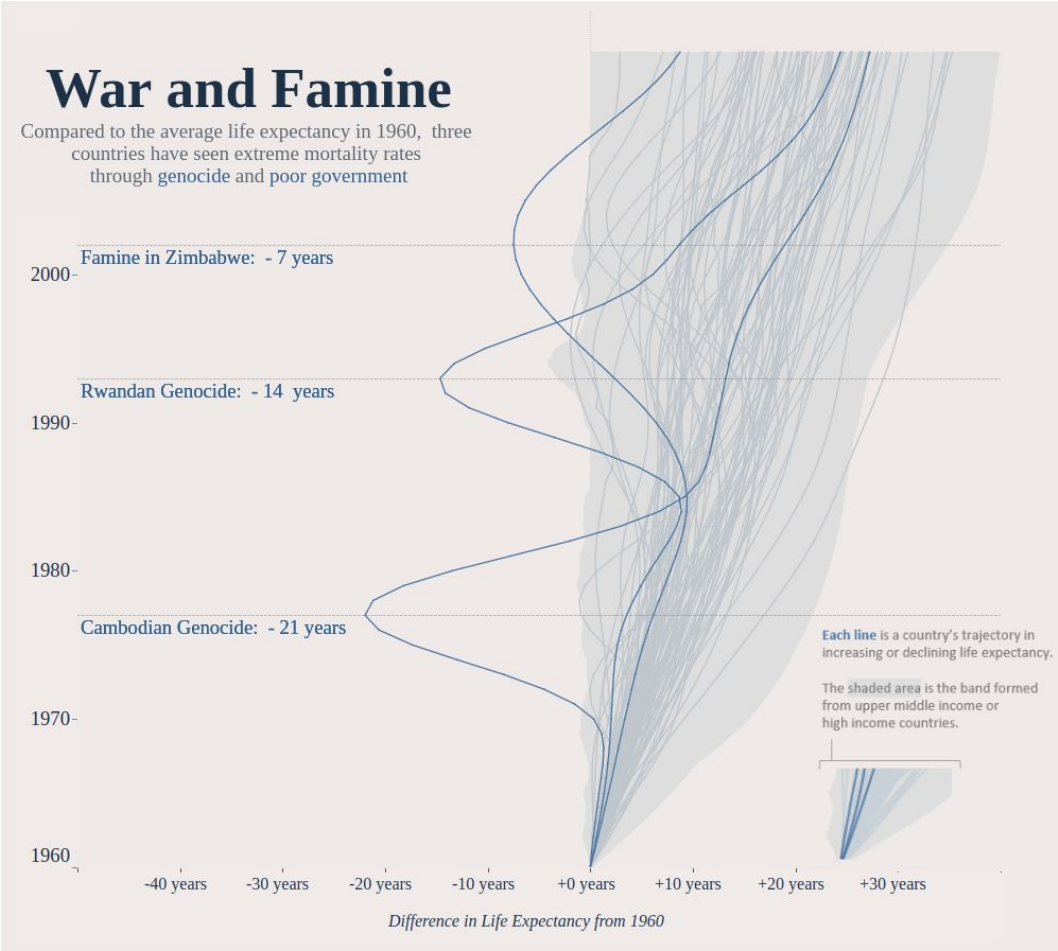
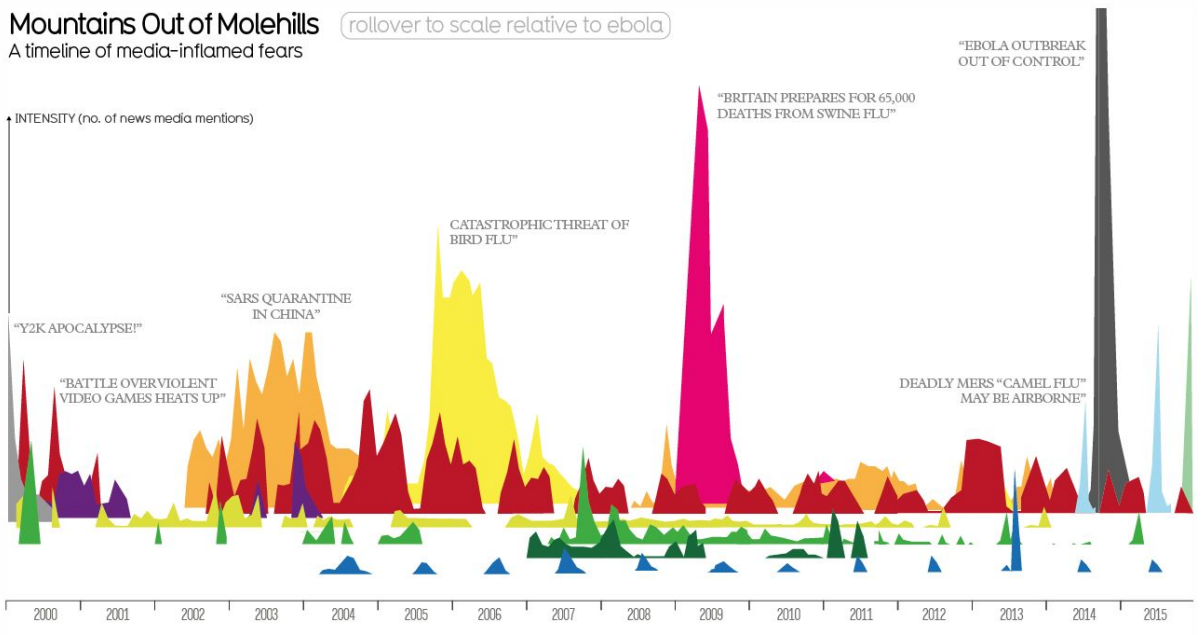


War and Famine

Gráficos de área

Iguales a los gráficos de línea,

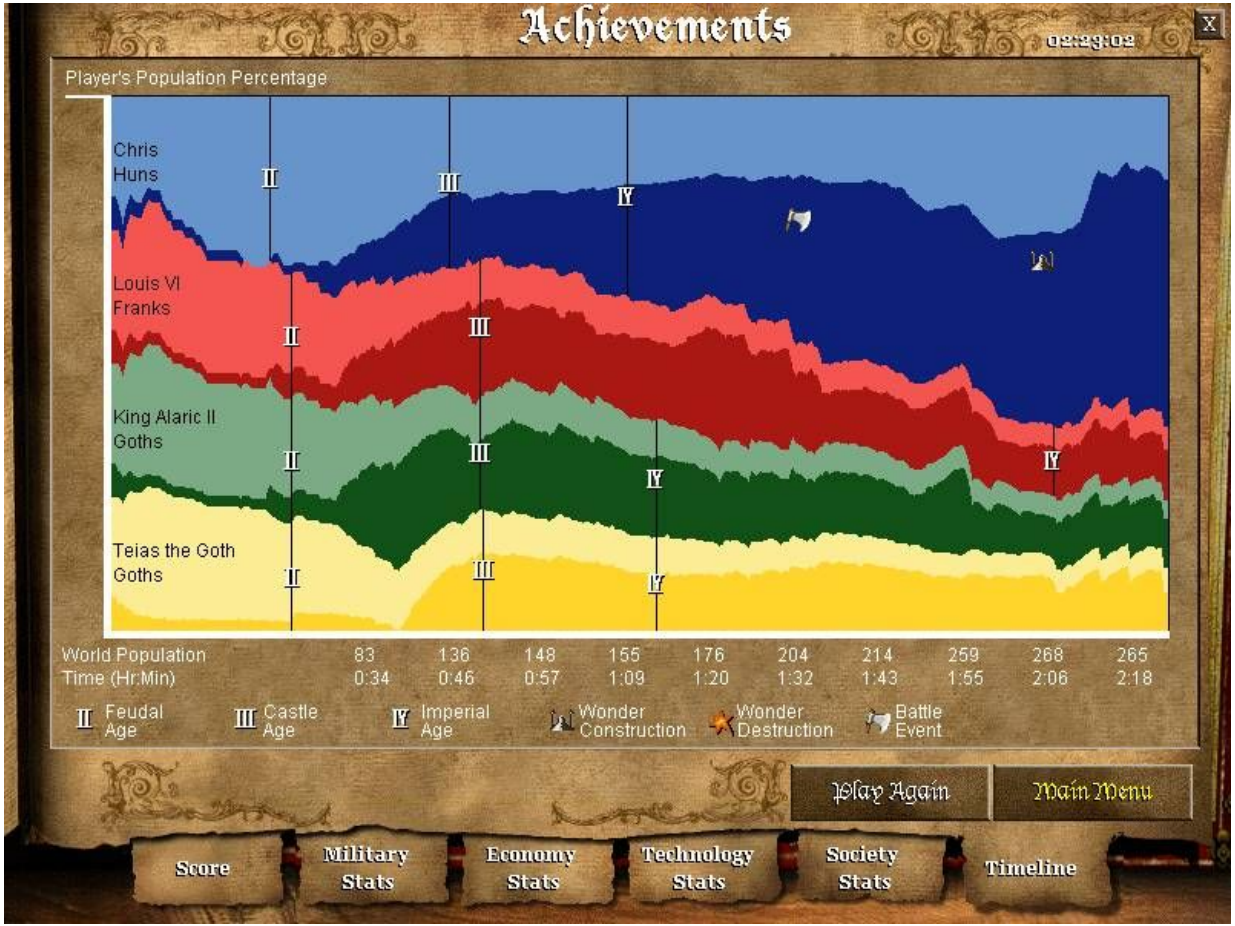
pero tienen más **impacto visual**.



Mountains out of molehills

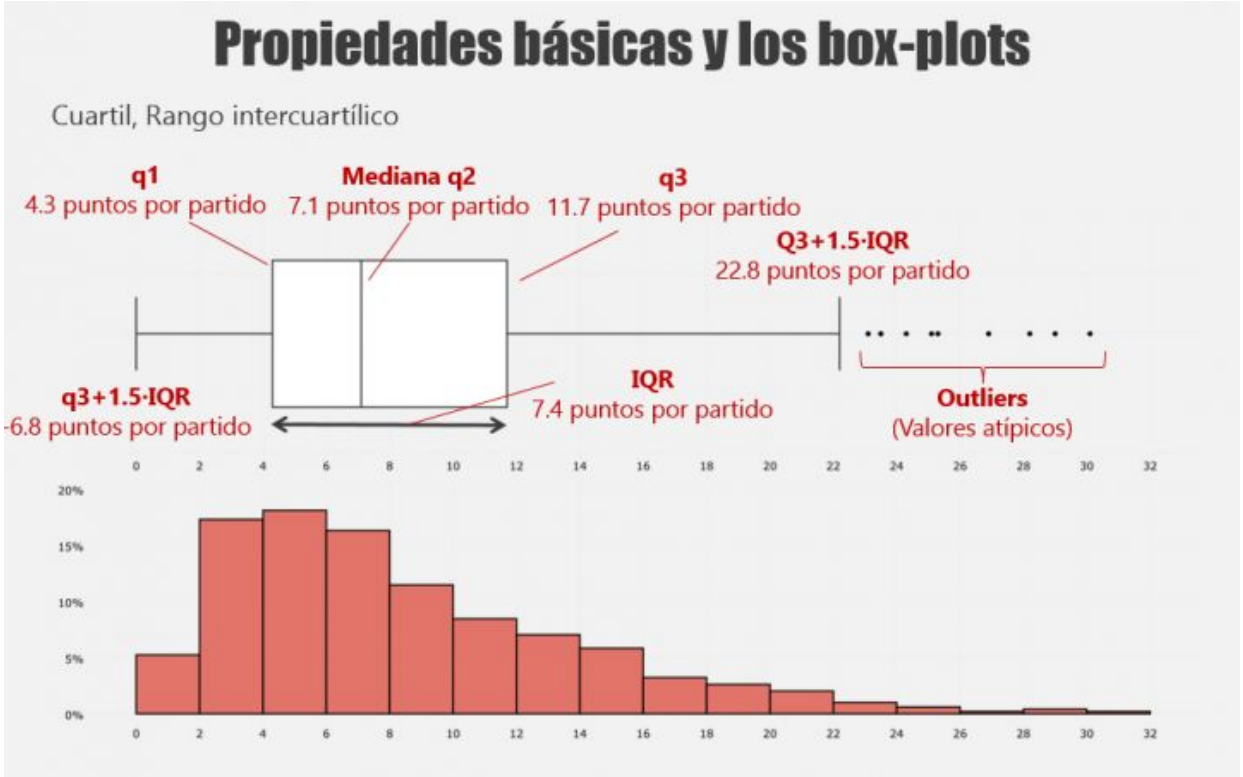
Gráficos de área

Pueden ser **apilados**, tomando propiedades similares a los gráficos de barra apilados



Gráficos de cajas

- Muestra la **distribución** de una **variable numérica continua**.
- Muestra información de forma más **condensada** que un histograma.



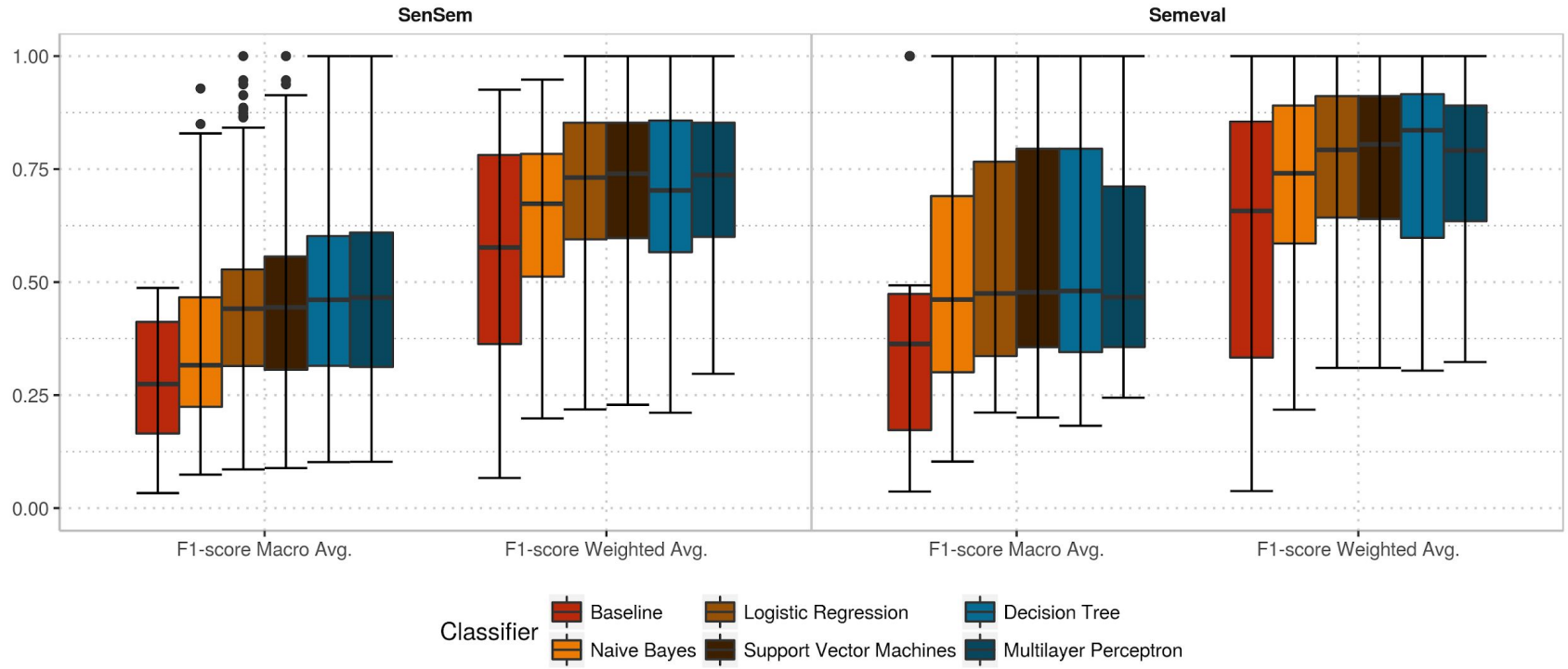
Como ser más rápido estudiando variables numéricas: El Boxplot

Ouliers

- Pueden ser parte de la distribución
    - Podemos querer ignorarlos intencionalmente
- Pueden ser originados por errores en el proceso de recolección de datos

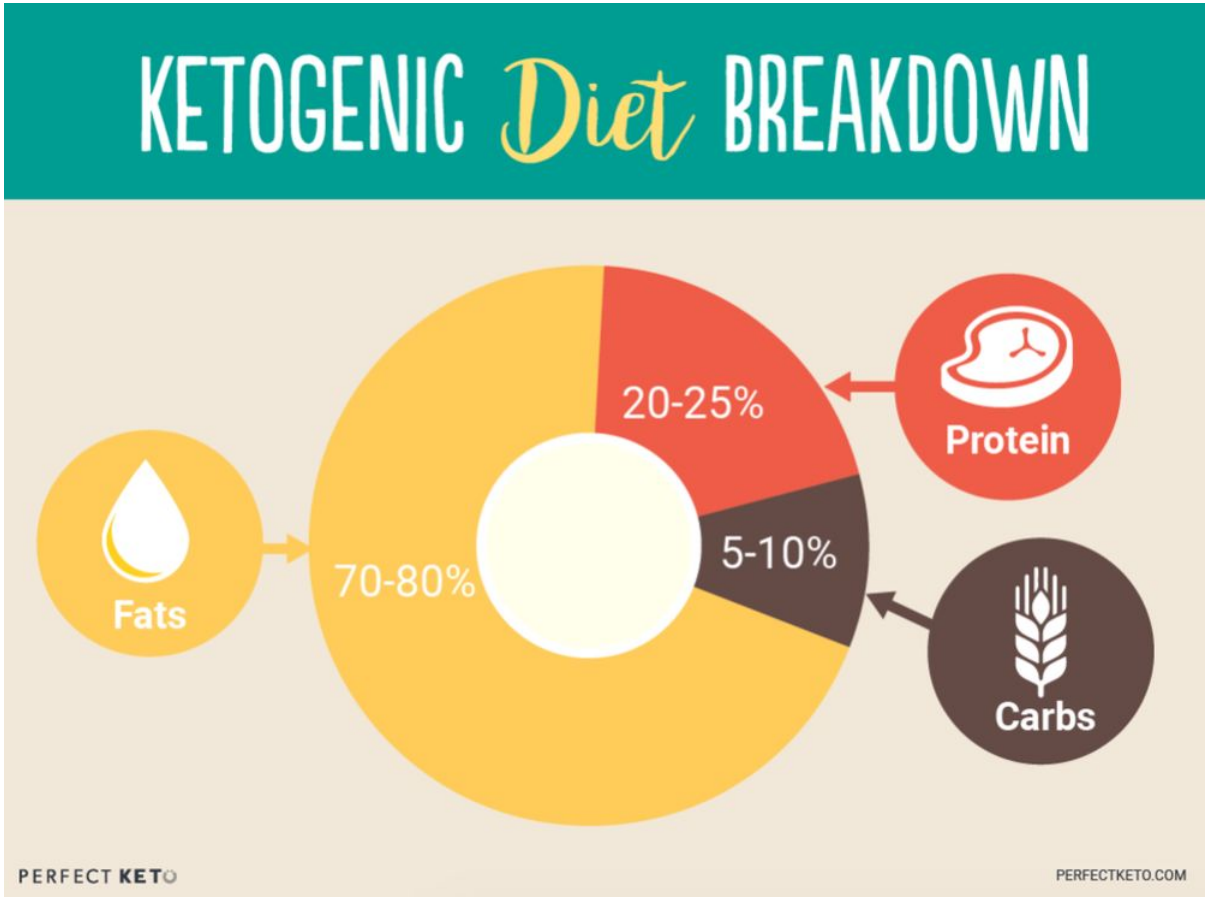
Como ser más rápido estudiando variables numéricas: El Boxplot

Gráficos de cajas



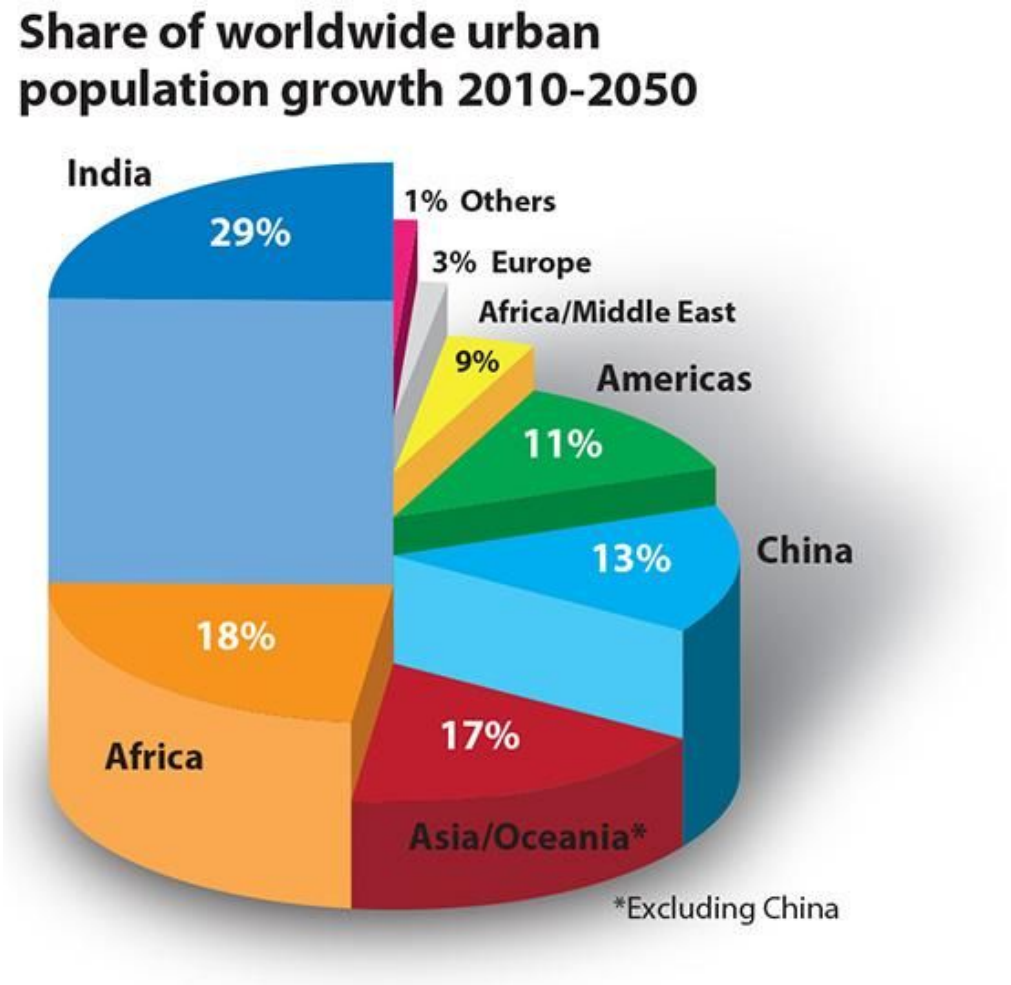
Gráficos de torta

Ilustra la distribución de la población con respecto a una **variable categórica**.



Why I choose Keto

The horror of pie charts

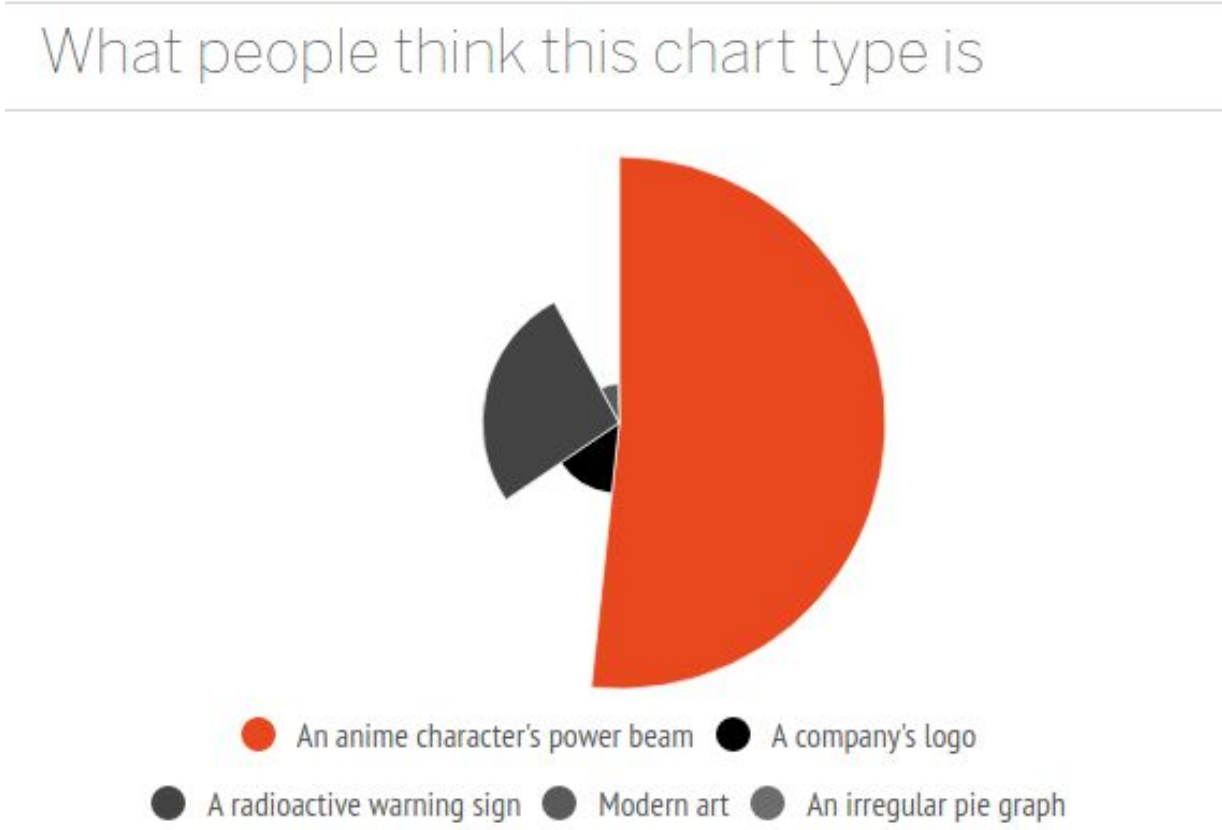


The Truthful Art: Data, Charts and Maps for Communication

Son tan malos, que seaborn no los tiene!

Gráficos de torta

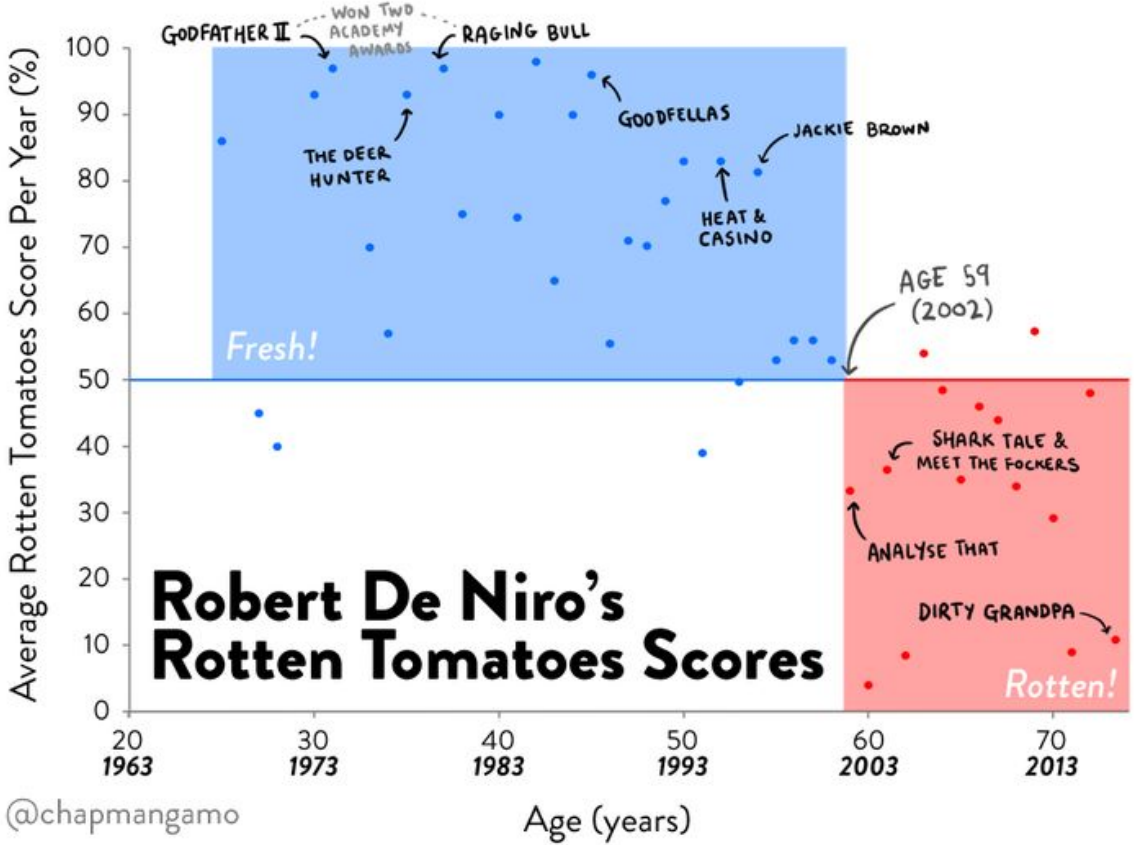
Elementos visuales adicionales facilitan la comparación entre elementos del gráfico



The infamous pie chart

Gráficos de puntos

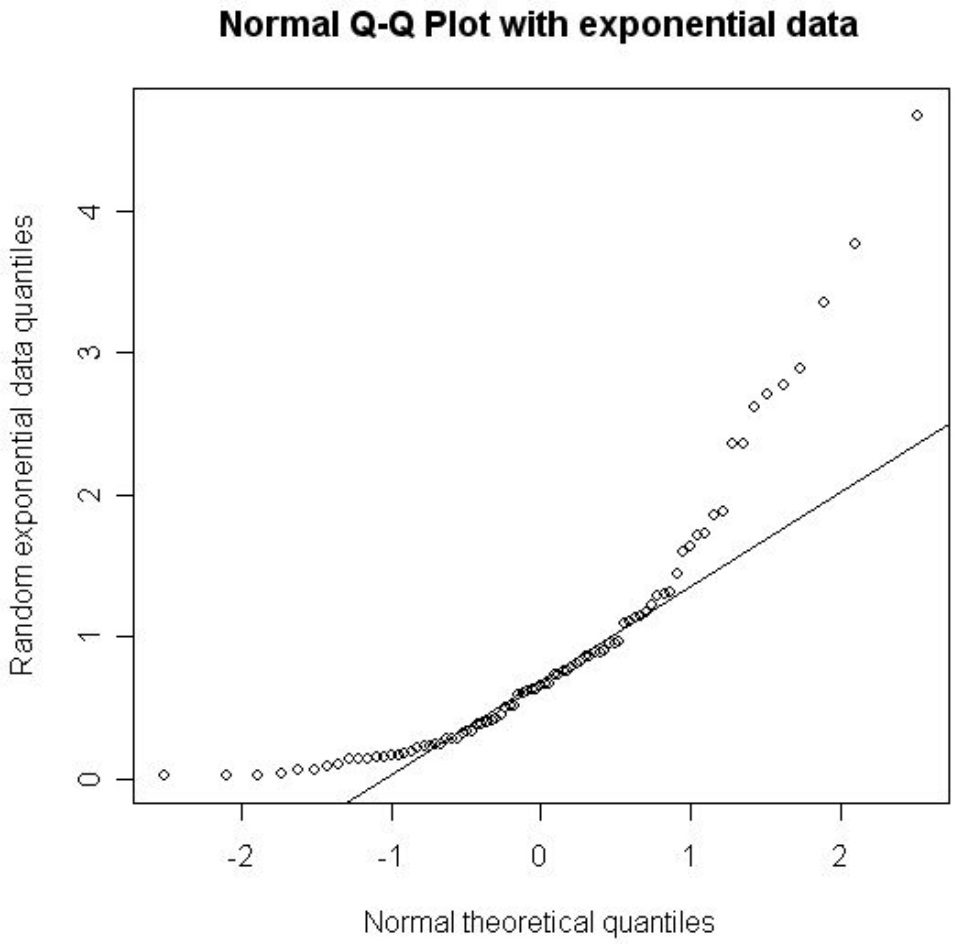
- Muestra la relación entre 2 o 3 **variables numéricas continuas**
- Puede usar color, forma de los puntos para variables categóricas, y tamaño para variables numéricas



Scatter plot shows exactly when Robert de Niro stopped making good films

Gráficos QQ

- Compara los cuartiles de dos muestras
- Sirve para ver que tan parecidas son las dos distribuciones de las que provienen las muestras



Tutoriales de Seaborn

- Visualizar datos categóricos: https://seaborn.pydata.org/tutorial/categorical.html
- Visualizar datos lineales https://seaborn.pydata.org/tutorial/relational.html#relational-tutorial
- Encontrar relaciones entre variables https://seaborn.pydata.org/tutorial/regression.html

¿preguntas?